International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

Experimental investigation of M60 grade coconut fibre reinforced concrete

KAMIREDDY ANIL REDDY, Email Id:kamireddyanilreddy12@gmail.com

A.RAVI KUMAR, Email Id: ravi06081991@gmail.com

A.M REDDY MEMORIAL COLLEGE OF ENGINEERING AND TECHNOLOGY

ABSTRACT:

Fibers have the ability to increase the strength and durability of concrete. There is a dramatic increase in construction costs, as well as a negative impact on the surrounding environment. As a result, a more well-rounded approach to building a better society focused on environmental concerns was adopted. Concrete's sweetening properties have been improved as a result of the widespread use of a coconut fibre. Coconut fibre is readily available, making it a suitable reinforcement material for concrete. Coconut fibre reinforced concrete is the subject of this investigation (CFRC).

At various fibre contents, the strength of coconut fibre concrete was analysed and compared to that of ordinary concrete. A variety of properties, such as flexural and compressive strength, have been studied for the coconut fibre concrete at various loads of cement and fibre (1%, 1.5 %, 2 percent, 2.5 %, 3 percent, 3.5 percent, 4 percent, 4.5 percent, 5%). Coconut fibres can be used in structural concrete to improve its mechanical qualities.

flexural and compressive strength, coconut fibre, M60 grade concrete, CFRC (coconut fibre reinforced concrete).

I. INTRODUCTION

1.1 General

Concrete, as a brittle material, has a short lifespan and a limited ability to withstand stress. Because it is the most used construction material, it requires additional support. Standard practise calls for continuous steel bars to be embedded within the concrete construction in locations where they can withstand the necessary tensile and shear pressures. Fibroconcrete is a composite material made from short, discontinuous fibres placed randomly throughout a concrete part (FRC). Cement-based composites typically use fibres formed from steel, glass and chemical compounds, or natural resources, as well as synthetic fibres. Traditional reinforcing steel bars, on the other hand, tend to be more widely spaced than fibres. It should be made clear that fibre is not a substitute for steel bars when it comes to reinforcing concrete. In sophisticated concrete technology, fibres and continuous reinforcing steel bars play

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal www.ijarst.in
ISSN: 2457-0362

completely distinct roles, and there are many applications in which each fibre and steel bar should be used. As a concrete reinforcement material, one of the most commonly utilised fibre types is coconut fibres (Coir fibres). As the most ductile natural fibre, coconut fibre has the potential to be employed in concrete reinforcing. Biodegradability ensures that there will be no negative impact on the environment. Fibers that come from coir-based manufacturing facilities can be used to make high-strength products. In addition, they are inexpensive, non-abrasive, and readily available. In the beginning, CFs were employed to prevent or control concrete shrinkage. Compressive strength is improved, energy absorption is enhanced, ductile behaviour is minimised prior to ultimate failure and durability is improved when CFs are used into the concrete mix. For the purpose of this study, the mechanical properties and uses of coconut fiber-reinforced concrete (CFRC) were examined in detail (CFRC). Fiber reinforced concrete is a type of concrete that contains cement, water, fine aggregate, coarse aggregate, and discontinuous coconut fibres. When coconut fibres are mixed with regular concrete, the result is a composite material that is stronger than ordinary concrete because it contains fibres that are spread evenly and at random throughout the mixture. In order to produce CFRC goods, the concrete mixture is mixed with coconut fibres and then transferred into moulds, where it is compressed and cured using the normal procedure. CFRC mixing and compacting is plagued by the problem of segregation or boiling. Fibers will not be distributed evenly if this is done. CFRC requires slightly more energy to be mixed, conveyed, placed, and finished.

II. LITERATURE REVIEW

2.1 LITERATURE REVIEW

Because coconut fibre is readily available, it is a suitable reinforcement material for concrete. It also serves as a new source of income for coconut producers, who benefit from the additional demand created by the development industry. Coir mattress trash may be effectively disposed of in this manner, which reduces the need for additional waste disposal infrastructure and eases the strain on currently available landfills and incineration facilities. Coating the fibres with oil may help alleviate the problem of their high rate of water absorption. As a result, natural fibres like coconut have been used to strengthen concrete. In addition, the fibres are made from non-toxic materials. Two fundamental changes are taking place in the building business. Building practises, notably the use of mechanised tools in construction, have advanced over time. The development of high strength concrete, for example, is an advancement in high-performance construction materials. Recent years have seen an increase in construction-related research and development of fibres and matrix materials, as well as fabrication processes. Because of their high strength-to-weight ratio, flexibility in shaping, and potential resilience to

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal www.ijarst.in
ISSN: 2457-0362

environmental conditions, concrete has an edge over other building materials in terms of maintenance costs. FRCB composite is a good alternative to traditional building materials because of these characteristics. They can be used in a variety of structures, such as offshore platforms, buildings, and bridges, as well as brand new ones, in the construction industry (Thou, 2005).

The high costs, limited availability, and corrosion problem of steel fibres are key roadblocks to the creation of high-performance concrete employing steel fibres. Reinforcement in concrete can be achieved by using coconut fibre, the most ductile of all natural fibres (Majid Ali et al., 2012). Biodegradability ensures that there will be no negative impact on the environment. The fibres obtained from coir-based manufacturing units can also be used to produce high-strength materials. Non-abrasive, inexpensive, and readily available are just a few of its advantages. Coconut-fibre ropes could be used as vertical reinforcement in mortar-free interlocking buildings, according to a new study. This is said to be a cost-effective method of building earthquake-resistant homes.

III. EXPERIMENTAL PROGRAMME

3.1 Materials Used:

The materials used in this investigation are

- OPC (43 Grade)
- Sand
- Coarse aggregate
- Water
- Coir fiber

3.1.1 Materilas Testing

3.1.1.1 Aggregates Sieve analysis

Sieve analysis is a method for determining the distribution of a material's particles in terms of size. The way a material performs in usage is frequently influenced by its size distribution. For the purpose of determining the fineness modulus of cement, this test was performed. In accordance with IS: 4031-1989 for cement and IS: 2386-1963 for aggregates, it was completed.

Fig 3.1: Sieves for Fine aggregates

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal
www.ijarst.in
ISSN: 2457-0362

Fig 3.2: Sieves for Coarse aggregates

IV. RESULTS AND DISCUSSIONS

4.1 Fresh properties of concrete

Tests are carried out on various concrete mixtures that contain coconut fibre. Slump test research tells us how much water is needed to make a concrete mix that is easy to deal with. This chart shows the slump of concrete that has been mixed with various percentages of coconut fibre, ranging from 1% to 5%. Table 4.1 shows the outcomes of the tests.

Table 4.1: Slump cone test

Cocounut fiber(%)	Slump (mm)
Control mix	120
1	110
1.5	105
2	98
2.5	93
3	85
3.5	82
4	78
4.5	72
5	70

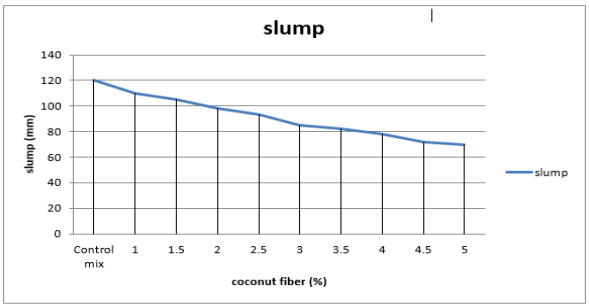

Fig 4.1: Slump test

Slump is 120 mm in the control mix. The slump value of concrete with increasing percentages of coconut fibre decreases, as has been found. Workability will be improved with a less amount of coconut fibre.

Improve the hardness of concrete

compressive force in cubes

Experimental specimens comprising 15cm cubes of ordinary concrete and coconut fibre reinforced concrete, each with a different amount of fibre, were subjected to compressive strength testing (1 percent , 1.5 percent , 2 percent 2.5 percent , 3 percent , 3.5 percent , 4 percent , 4.5 percent 5 percent). In total, nine different specimens were evaluated for every possible combination of coconut fibre addition to concrete.

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal www.ijarst.in
ISSN: 2457-0362

Table 4.2:Cubes Compressive strength (N/mm²)

Cocounut fiber(%)	7days	14days	28days
Control mix	41	56.1	62.1
1	43	58.2	64.8
1.5	46	59.5	65.8
2	44	57	63.5
2.5	40	52	61.72
3	35	49.2	58.2
3.5	31	45.64	54
4	28	42.34	51.8
4.5	25.3	36.2	48.45
5	20	32.84	45

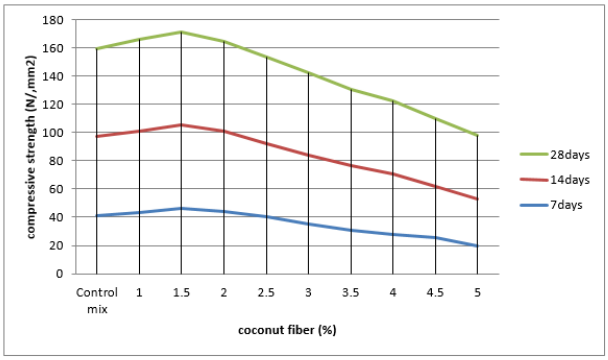

Fig 4.2:Cubes Compressive strength

Fig 4.3:compressive strength test specimen

When compared to a control mix, the compressive strength of various concrete mixes including 1%, 1.5%, and 2 percent coconut fibres was higher.

Flexural strength of beams, section 4.2.2

Standard 15cm x 10cm x 10cm specimens of ordinary concrete and coconut fibre reinforced concrete were cast at varied percentages of fibre and tested for flexural strength (1 percent , 1.5 percent , 2 percent 2.5 percent , 3 percent , 3.5 percent , 4 percent , 4.5 percent 5 percent). Loading under an apparatus for flexural strength was used in each case to determine the 28-day strength values. There were three concrete specimens for each combination of coconut fibre inclusion in concrete that was evaluated.

4.3 Flexural strength (N/mm2)

Cocounut fiber(%)	28days
Control mix	8.42
1	8.44
1.5	8.58
2	8.52
2.5	8.43
3	8.31
3.5	8.18
4	7.78
4.5	7.55
5	7.32

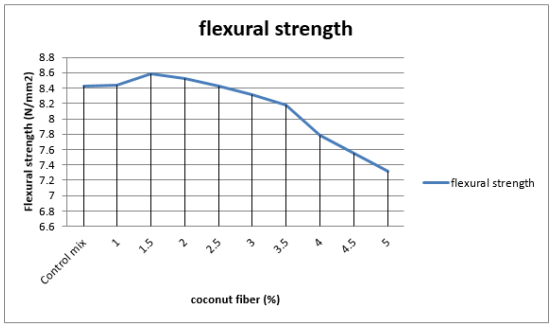

Fig 4.4:Beams flexural strength

International Journal For Advanced Research In Science & Technology
A peer reviewed international journal www.ijarst.in
ISSN: 2457-0362

V. CONCLUSION

- ✓ Coconut fibre is plentiful at the test site, making it an ideal reinforcement material for concrete. As a result, the coconut grower is able to reap the benefits of the building industry's increased demand for the product. Coir mattress trash can be safely and effectively recycled, reducing the need for new landfills and incinerators while also reducing the burden on already overburdened facilities. Since they are made from natural materials, coconut fibres are good for the environment and can help reduce the world's carbon footprint significantly. When comparing the workability of this concrete to normal concrete, we found that a small amount of coconut fibres can improve its compressive strength by as much as 2 percentage points.
- ✓ To put it another way, the fibres in the 3 percent of fiber-reinforced concrete are not evenly dispersed and form balls.
- ✓ The matrix-to-matrix bond is much stronger than in regular concrete.
- ✓ There is a reduction in coconut fibre concrete density (i.elight weight concrete).
- ✓
- ✓ 3 percent of the fiber-reinforced concrete has a reduced compressive strength compared to regular concrete.
- ✓ After compressive loading, evaporation losses are decreased and cracks are minimised (i.e microcracks are reduced).
- ✓ Concrete constructions should consider adding 1.5 percent coconut fibres.

REERENCES

1. Concrete Technology by M.S.ShettyApplication of sugarcane Coconut fibres asconcrete composites for rigid pavement Dipan PatelME (Transportation), and Prof. V M Patel (2015April) GEC modasa, india.
2. Investigation of the performance ofnatural fibres as a micro reinforcement inconcrete**:** waweru nancy mugure(April2014) university of nibori, nibori, kenya.
3. Characteristics of sugarcane fibres by S D Asagekarand V K Joshi, india.
4. Parameswaran, V.S., and Rajagopalan, K.; Srengthof concrete beams with aligned or random steelfibre micro-reinforcement, 1st RILEM Symposiumon Fibre-Reinforced Concrete, **1**, 1975, pp. 95-103,1975.
5. Ramakrishna, G., and Sundara, T., (2005). Studyinto the durability of natural Cement and concretecomposite fibres and the effect of corroded fibres onthe strength of mortar, **27**, (5), 2005, pp. 575-582.

6. Rehsi S.S., Use of natural fibre concrete in India.Concrete technology and design Natural fibrereinforced cement and concrete, **5,** 1988, pp. 243-256.
7. Romildo, D., Toledo, F., Karen, S. England, G. L.and G. Havami, K., durability of alkali-sensitivesisal and coconut fibres in cement mortarcomposite, Cement and concrete composite, **22**, (2),2000, pp. 127-143.
8. Sreeniwasa, A., Influence of delignification andalkaline treatment on the fine structure of coirfibres, Journal
9. Majid Ali, Nawawi Chouw (2012),"Experimentalinvestigations on coconut-fibre rope tensile strength andpullout from coconut fibre reinforced concrete",Construction and Building Materials, 41, 681–690
10. Reis J.M.L (2005),"Fracture and flexuralcharacterization of naturalfiber-reinforced polymerconcrete", Construction and Building Materials 20(2005) 673–678
11. Majid Ali, Anthony Liu, HouSou, Nawawi Chouw(2011),"Mechanical and dynamic properties of coconutfibre reinforced concrete" Construction and BuildingMaterials 30 (2011) 814–825
12. Noor Md. Sadiqul Hassan, Habibur Rahman Sobuz(2012),"Use of coconut fibre in production of structurallight weight concrete", Journal of applied sciences12(9) 831- 839, 2012
13. Vijay Chavada, A.A Parikh (2013), "An applicationreview of coir fibre reinforced concrete", Vol. 2Issue 4 ISSN: 2278-7844
14. A Zuraida, H Zahurin, I Sopiyan (2011),"Effect of fibrelength variation on physical and mechanical propertiesof coir fibre reinforced concrete",Materials Physics andMechanics 16 (2013) 107-117
15. P Nibasumba, X L Liu (2011),"Recent developments infibre reinforced concrete and their effect on concretecolumns analysis", Construction and Building Materials2011;18(7):549–58
16. Joanna M Ferraz, Sabrina A Martins, Claudio H.S DelMenezzi (2013), "Effect of coir fibre treatment andcoir-fibre ratio on properties of cement bondedcomposites", Bio Resources 6(3), 3481-3492.
17. Dr.M.Sivaraja (2009), "Application of Coir Fibres asConcrete Composites for Disaster prone Structures"International Journal of Civil and EnvironmentalEngineering Sci., Vol. 33, No. 6, December 2009, pp.719–729.
18. Izad Amir Bin Abdul Karim (2012),"Effect of coconutwaste on concrete structure component"ARPN Journalof Engineering and Applied Sciences, 30(2012). 2538 –2547.

19. Yalley, P. P. and Kwan, A.S K (2008), "Use ofcoconut fibre as an enhancement of concrete",International Journal of Sustainable ConstructionEngineering &Technology, 27(5), 2008, pp. 575-582.
20. Kamel K.Alzboon and Khalid N.Mahasneh (2009),"Effect of Using Mattress Waste on the CompressionStrength and Slump Characteristics of Concrete",Construction and Building Materials 2009;23(2):865.
21. Nanayakkaza N.H, (2011) "Characterisation anddetermination of properties of Sri Lanka coconut",Journal of Natural Fibres, 2(1), 2011, pp 69-81.
22. Bhowmick B.B. and Debnath C. R. (2007),"Properties of coir", Indian coconut journal, 15, (5),2007. p.12.
23. Experimental Studies on Coconut Fibre and Banana Fibre Reinforced Concrete by RAPHAEL CHACKO, S HEMA AND M VADIVEL, International journal of earth science and engineering.
24.